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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/634,662

08/04/2003

Mei Chang

005975/P1

6355

44257 7590 01/29/2007

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EXAMINER

STOUFFER, KELLY M

ART UNIT

PAPER NUMBER

1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/29/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/634,662

Applicant(s)

CHANG ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,7-11,13,14,16-18,20-22,24,27-31,33-37 and 53-75 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,7-11,13,14,16-18,20-22,24,27-31,33-37 and 53-75 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments, filed 10 January, with respect to the objection to the drawings, specification, and oath/declaration have been fully considered and are persuasive. The objections of the drawings, specification, and the oath/declaration has been withdrawn.

Applicant's arguments, with respect to the 35 USC 112 1<sup>st</sup> paragraph rejection have been fully considered and are persuasive. The 35 USC 112 1<sup>st</sup> paragraph rejection of claims 14, 16-18, 20-22, 24, 54-61, and 63-75 has been withdrawn.

Applicant's arguments with respect to the 35 USC 102(e) rejection under Kim have been fully considered but they are not persuasive. The applicant argues that Kim does not teach all of the elements of claim 1, specifically using the claimed ligands in the precursor. Though Kim does not include every precursor of the group in claim 1, it does contain some of the precursors in paragraph 0030 as C1-C8 alkylcyclopentadienyl ligands which meet the limitations of the claims, such as bis(2,4-dimethyl pentadienyl) ligands. Regarding claim 4, it is unclear what the applicant is arguing, as Kim teaches the limitations and there are no limitations indicating a desired temperature in claim 4 and the teaching in Kim of 600 °C in paragraph 0010 is a deposition temperature or temperature of the precursor and not necessarily the substrate temperature. Kim teaches the remainder of the claim limitations as discussed in the previous office action. This rejection is therefore maintained and is repeated here in its entirety.

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Applicant's arguments with respect to the 35 USC 103(a) rejection under Kim in view of DelaRosa et al. have been fully considered but they are not persuasive. It is unclear what the applicant is arguing with regard to what DelaRosa et al. does not disclose. The applicant argues that motivation is not present to modify Kim in view of DelaRosa et al. However, the examiner provided motivation in the previous office action of modifying Kim with the teachings of DelaRosa et al. to gain the benefits of an optimized pulse length of gases during deposition. The remainder of the limitations of the claims are taught by Kim in view of DelaRosa et al. as discussed in the previous office action. This rejection is therefore maintained and is repeated here in its entirety.

The terminal disclaimer filed 10 January 2007 is sufficient to overcome the Obviousness-type Double patenting rejection. This rejection is thus withdrawn.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4, 7-10, 27-30 and 33-36 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent publication 2002/0173054 to Kim. Regarding claims 1, Kim discloses forming a ruthenium layer on a substrate comprising positioning a substrate in a chamber and exposing the substrate to a ruthenium material and

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reducing gas in an atomic layer deposition process where the ruthenium precursor has C1-C8 alkylcyclopentadienyl ligands (paragraphs 0019-0022). Thus Kim meets all the recitations of claim 1 at least as broadly recited by claim 1.

Regarding claim 2, Kim discloses an ALD process where the precursor, purge gas, reducing gas, and purge gas are pulsed sequentially. Kim meets all the recitations of claim 2 at least as broadly recited by claim 2.

Regarding claim 4, Kim discloses the reducing gas as hydrogen in paragraph 0036 line 1. Kim meets all the recitations of claim 4 at least as broadly recited by claim 4.

Regarding claim 7, Kim discloses the purge gas as He, Ar, or hydrogen in paragraph 0038.

Regarding claims 8-10, Kim discloses the pulse duration of each gas in the ALD cycle to last from 0.1 to 5 seconds, which includes the ranges required by claims 8-10. Kim meets all the recitations of claims 8-10 at least as broadly recited by claims 8-10.

Kim meets the recitations of claims 27, 29, 30 and 33-36 as discussed above. With regard to claim 28, Kim discloses repeating the ALD process until a desired layer thickness is achieved in paragraph 0028. Kim meets all the recitations of claims 27-30 and 33 at least as broadly recited by claims 27-30 and 33-36.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5, 13, 31, 53 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of US Patent number 6527855 to DelaRosa et al. Kim includes all the provisions of claims 5 and 31 (substrate temperature paragraph 0025) except providing a pressure below 80 torr. DelaRosa et al. discloses the chamber pressure to range from 0.1 to 10 torr (column 3 lines 52-54) in order to affect the pulse length of gases in a desirable manner (column 3 lines 39-42).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to include a chamber pressure below 80 torr as taught by DelaRosa et al. in order to affect the pulse length of gases in a desirable manner.

Regarding claims 13, 53, and 62, DelaRosa et al. includes a reactor for the ALD process that includes an inlet laminar flow expansion zone (column 4 lines 30-33) that can be considered an expanding channel from which to expel gases over the substrate at least as broadly recited in the claims.

Claims 11 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim. Kim includes all of the requirements of claims 11 and 37 except for providing a specific layer width. The width of the layer, however, depends upon the number of cycles and is only important for the types of applications for which the layer will be used. (implied by Kim, entire document and paragraph 0028) The width of the layer is therefore modified by routine experimentation and is not inventive.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to include the width of the layer from 10-100 Å by routine experimentation in order to meet a certain application absent evidence showing a criticality for the claimed range.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer

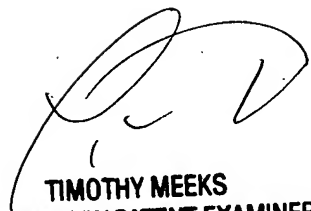


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TIMOTHY MEEKS  
SUPERVISORY PATENT EXAMINER